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HARNESSING AI TO REVOLUTIONIZE TECHNICAL ENGLISH TEACHING

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Abstract: *This paper investigates the role of AI in teaching technical English, drawing upon a corpus of IT-related learning materials compiled in* IT Collection Exercises *(Rashkova & Slavova, 2024). The analysis emphasizes AI's contribution to personalization, automated feedback, vocabulary acquisition, and authentic language use in technology-driven settings. The paper concludes that AI-based pedagogy, when carefully integrated, provides significant opportunities for advancing ESP curricula.*
Key words: AI-based pedagogy, AI-enhanced intervention, automated feedback, personalization

INTRODUCTION

For learners in technical fields such as information technology (IT), engineering, and applied sciences, proficiency in *technical English* is not merely an academic asset but a professional necessity. Technical English encompasses not only general linguistic competence but also mastery of specialized vocabulary, comprehension of technical documentation, and the ability to communicate effectively in professional contexts. Learners are often required to navigate authentic materials such as software documentation, technical manuals, and research papers, as well as engage in domain-specific oral and written communication tasks. Traditional pedagogical approaches, while effective in imparting basic grammar and vocabulary, frequently struggle to accommodate the dynamic and highly contextualized nature of technical English.

The convergence of AI and technical English instruction responds to several pressing challenges. First, technical vocabulary acquisition is often difficult for learners due to the breadth and specificity of terminology. Second, learners face difficulties in applying general English knowledge to specialized contexts where discourse structures may differ significantly. Third, there is an increasing demand for scalable solutions to ESP (English for Specific Purposes) training, particularly in vocational education and training (VET) contexts where resources may be limited. AI applications offer potential solutions to these challenges by enabling adaptive vocabulary training and context-aware reading comprehension exercises.

The *IT Collection Exercises* (Rashkova & Slavova, 2024), which form the empirical foundation of this study, illustrate the type of domain-specific content that can benefit from AI integration. The collection comprises a broad spectrum of topics—including programming languages, storage devices, communication, social networking, robotics, artificial intelligence, and cybersecurity—structured around reading tasks, vocabulary building, translation, and academic writing exercises. For instance, tasks requiring

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learners to compare programming languages, identify synonyms in technical texts, or analyze case studies of online communication directly engage with specialized discourse and terminology. When enhanced by AI tools such as adaptive glossaries, automated writing evaluators, and intelligent feedback systems, such materials can evolve into interactive learning environments that foster deeper engagement and mastery.

EXPOSITION

To illustrate the practical potential of Artificial Intelligence (AI) in teaching technical English, this case study applies selected AI tools to tasks drawn from the *IT Collection Exercises* (Rashkova & Slavova, 2024). The exercises, covering topics such as programming languages, communication, robotics, and artificial intelligence, provide authentic contexts in which learners must process technical information, manipulate specialized vocabulary, and produce domain-specific texts. By integrating AI into these tasks, the study demonstrates how traditional materials can be enhanced to support personalization, motivation, and deeper learning.

1. Programming Languages: Vocabulary and Comparative Writing

One of the initial sections of the *IT Collection Exercises* introduces learners to major programming languages such as Java, C, C++, Python, and PHP, followed by vocabulary activities and comparative writing tasks. Learners are asked to identify synonyms for terms such as "awkward," "chaotic," or "unstable," and to compare Java and C in 180 words using linkers of comparison and contrast.

AI-enhanced intervention:

- **Adaptive Vocabulary Tutor:** Using natural language processing (NLP), an AI system highlights technical terms (e.g., "compiler," "interpreter," "code portability") in the reading passage. When a learner selects an unfamiliar term, the system provides a definition, pronunciation, and context-sensitive examples. If a learner repeatedly struggles with "interpreter," the system generates additional practice exercises contrasting compilers and interpreters, with self-assessment quizzes adapted to learner performance.
- **Automated Feedback on Contrastive Writing:** When students submit their comparative essay on Java vs. C, an AI writing assistant analyzes coherence, technical accuracy, and use of comparative structures. For example, if a student writes "Java is more portable than C because of JVM, while C is more faster," the system suggests corrections ("faster," not "more faster") and provides a domain-specific note: "JVM allows Java programs to run across platforms, unlike C programs, which require recompilation."

These interventions show how AI tools can personalize technical vocabulary acquisition and scaffold comparative academic writing while reinforcing accuracy in both language and technical content.

2. Storage Devices: Reading Comprehension and Terminology

In the section on storage devices, learners encounter a text explaining differences between memory (RAM) and storage, with exercises such as true/false questions, synonym matching, and a video-based discussion of quantum computers.

AI-enhanced intervention:

- **AI Comprehension Coach:** After learners answer comprehension questions (e.g., "Video memory is a volatile, especially fast type of RAM"), an AI tutor evaluates responses and generates tailored

follow-up questions. If a learner incorrectly identifies a hard disk drive as semiconductor storage, the system provides an adaptive explanation, illustrating the distinction between magnetic and semiconductor storage with diagrams and examples.

- **Synonym Practice with Semantic Networks:** Learners are asked to find synonyms for words like "outdated," "liable to," and "progress." An AI tool generates additional synonyms ranked by register and context (e.g., "obsolete" vs. "archaic" for "outdated") and provides IT-specific examples ("Magnetic diskettes are obsolete storage devices"). This dynamic synonym support moves beyond static lists, encouraging learners to consider nuance and contextual usage.
- **AI-Supported Video Engagement:** For the quantum computing video, an AI system generates transcript-based cloze tasks and comprehension questions. Learners who struggle with the concept of qubits receive AI-generated analogies, such as comparing qubits to spinning coins that can represent multiple outcomes simultaneously.

Through these enhancements, AI supports technical comprehension and contextualizes abstract concepts like quantum computing in learner-friendly ways.

3. Communication and Social Networking: Critical Discussion

Exercises on communication and social networking focus on mobile phone use, video conferencing, and social media, asking learners to explain reasons for behaviors, participate in discussions, and compose short essays.

AI-enhanced intervention:

- **Conversational AI Debates:** Learners participate in structured debates with an AI chatbot simulating a peer or instructor. For instance, when prompted with "Mobile phones kill real-life communication," the AI agent challenges learner responses with counterarguments, encouraging critical thinking and the use of discourse markers ("On the other hand," "Conversely").
- **Sentiment and Register Analysis:** AI tools analyze learners' discussion contributions, identifying tone, register, and appropriateness. For example, if a learner writes "I think mobiles are bad, like super bad," the system suggests academic alternatives: "I strongly believe mobile phones negatively affect interpersonal communication."
- **Essay Drafting with Feedback Loops:** For the essay on whether "video-conferencing is better than face-to-face," learners draft responses and receive AI-driven feedback on structure (introduction, arguments, conclusion), lexical variety, and use of academic connectors. The system highlights missing counterarguments and suggests relevant ideas drawn from the provided text.

By simulating debate partners and providing targeted feedback, AI fosters critical engagement and strengthens academic writing skills in technical domains.

4. Robots: Future of Education and Professional Communication

The robotics section presents texts on robot teachers, discussions of AI risks, and academic writing tasks such as "Would you like to have a robot as a teacher? Why? Why not?"

AI-enhanced intervention:

- **Scenario-Based Chatbots:** Learners interact with an AI agent simulating a "robot teacher," asking and answering questions on IT topics. This conversational practice develops both technical vocabulary and pragmatic skills for professional exchanges.
- **Argument Mapping Tools:** When learners write essays on robot teachers, AI tools generate visual maps of arguments (pros, cons, examples). If a learner's essay lacks supporting evidence, the AI suggests integrating domain-specific examples, such as robot-assisted grading systems or AI-driven adaptive tutors.
- **Bias Awareness Exercises:** AI systems analyze learner essays for potential over-reliance on utopian or dystopian narratives. For instance, if a student argues "Robots will never be able to teach because they don't have feelings," the system provides counterexamples of empathy simulations and scaffolding tools, prompting deeper analysis.

These interventions highlight how AI can stimulate reflection, structure argumentation, and support complex writing tasks in technical English.

5. Artificial Intelligence: Domain Knowledge and Writing

The *IT Collection Exercises* include a section on AI itself, asking learners to read policy texts, identify synonyms and antonyms, and write essays on topics such as "Is Artificial Intelligence an Existential Risk?"

AI-enhanced intervention:

- **Automated Policy Summarization:** Learners read about AI strategies in India. An AI summarization tool condenses the text into bullet points, helping learners grasp complex information. The system then prompts learners to compare their own summaries with the AI-generated one, supporting metacognitive awareness.
- **Technical Vocabulary Mining:** NLP tools extract key terms such as "deep learning," "data-guzzling," or "open libraries." Learners practice these terms with AI-generated gap-fill activities and contextual examples.
- **Essay Evaluation on Existential Risks:** When learners write essays on AI risks, an AI writing assistant scores arguments based on relevance, evidence, and balance. The system highlights unsupported claims and suggests integrating real-world references (e.g., ethical debates on autonomous weapons).

By integrating domain knowledge with technical vocabulary and critical writing, AI fosters deeper engagement with specialized discourse.

6. Translation and Multilingual Practice

Several exercises involve translating idiomatic Bulgarian expressions about cyber communication into English. These translations require sensitivity to cultural nuance and technical register.

AI-enhanced intervention:

- **Neural Machine Translation (NMT) with Feedback:** Learners first attempt their own translations (e.g., "Cyber communication is as cheap as chips"). AI translation tools then provide equivalents, with explanations of idiomatic alignment and domain-specific clarity.
- **Contrastive Corpus Exploration:** AI-driven concordancers show learners how target idioms appear in authentic English corpora. For example, "hooked on social networking sites" can be compared to "addicted to social media," illustrating register differences.
- **Cultural Sensitivity Checks:** AI systems flag literal translations that

fail to capture idiomatic meaning, prompting learners to reflect on pragmatic appropriateness.

This approach not only supports accuracy but also cultivates intercultural awareness, a crucial skill for technical professionals in global contexts.

7. Summary of Case Study

The case study demonstrates how AI tools can be mapped onto diverse technical English tasks, transforming static exercises into dynamic learning experiences. Across programming, storage, communication, robotics, and AI topics, AI contributes in five main ways:

1. **Personalization** – Adaptive glossaries and vocabulary tutors tailor learning to individual needs.
2. **Automation** – AI feedback systems handle routine error correction, freeing teachers for higher-level guidance.
3. **Simulation** – Conversational agents create authentic technical communication scenarios.
4. **Critical Engagement** – AI argument mapping and bias detection promote deeper reflection in academic writing.
5. **Intercultural Competence** – AI translation tools foster awareness of pragmatic and cultural nuances.

CONCLUSION

By embedding AI in task design, the *IT Collection Exercises* evolve into an interactive, learner-centered corpus that supports the acquisition of technical English in ways traditional instruction alone may struggle to achieve. The case study analysis demonstrates the potential of Artificial Intelligence (AI) to enhance technical English learning across multiple task types. By integrating AI into exercises focused on programming languages, storage devices, communication, robotics, and artificial intelligence itself, learners gain access to personalized support, authentic practice opportunities, and adaptive feedback.

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